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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

LEWIS, MONICA

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 11/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/846,127

Applicant(s)

CHEN ET AL.

Examiner

Monica Lewis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 and 21-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 21-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 April 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 15.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the amendment filed August 8, 2003.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chuman et al. (U.S. Patent No. 6,023,124) in view of Hu (U.S. Patent No. 6,328,620).

In regards to claim 1, Chuman et al. ("Chuman") discloses the following:

- a) an electron supply (12) (For Example: See Figure 1);
- b) a cathode layer (15) (For Example: See Figure 1); and
- c) a tunneling layer (13) disposed between the electron supply and the cathode layer (For Example: See Figure 1).

In regards to claim 1, Chuman fails to disclose the following:

- a) an annealing process.

However, Hu discloses an annealing process (For Example: See Column 3 Lines 45-49).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include an annealing process as disclosed in Hu because it aids in improving the contact among components (For Example: See Column 3 Lines 46-64).

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Additionally, since Chuman and Hu are both from the same field of endeavor, the purpose disclosed by Hu would have been recognized in the pertinent art of Chuman.

In regards to claim 2, Chuman disclose the following:

a) tunneling layer is a metal cluster dielectric (For Example: See Column 4 Lines 20-62).

In regards to claim 3, Chuman discloses the following:

a) tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , WSiN , TaAlO_xN_y , TaAlO_x , and AlO_xN_y (For Example: See Column 4 Lines 20-62).

In regards to claim 4, Chuman discloses the following:

a) cathode layer is selected from the group consisting of platinum, gold, molybdenum, tantalum, iridium, ruthenium, chromium, and alloys thereof (For Example: See Column 7 Lines 60-62).

In regards to claim 5, Chuman discloses the following:

a) emission current of greater than 1×10^{-2} Amps per square centimeter (For Example: See Column 2 Lines 17-28).

Additionally, the applicant has not established the critical nature of the emission current of greater than 1×10^{-2} Amps per square centimeter. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 6, Chuman discloses the following:

a) emission current of greater than 1×10^{-1} Amps per square centimeter (For Example: See Column 2 Lines 17-28).

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Additionally, the applicant has not established the critical nature of the emission current of greater than 1×10^{-6} Amps per square centimeter. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 7, Chuman discloses the following:

a) emission current of greater than 1×10 Amps per square centimeter (For Example: See Column 2 Lines 17-28).

Additionally, the applicant has not established the critical nature of the emission current of greater than 1×10 Amps per square centimeter. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 8, Chuman discloses the following:

a) tunneling layer has a thickness less than about 500 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 500 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that

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the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 9, Chuman discloses the following:

a) tunneling layer has a thickness less than about 250 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 250 Angstroms. “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 10, Chuman discloses the following:

a) tunneling layer has a thickness less than about 100 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 100 Angstroms. “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 11, Chuman discloses the following:

a) tunneling layer has a thickness of about 50 Angstroms (For Example: See Column 5 Lines 30-33).

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Additionally, the applicant has not established the critical nature of the dimension of 50 Angstroms. “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 12, Chuman discloses the following:

a) tunneling layer has a thickness within the range of 50 to about 250 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 50 to about 250 Angstroms. “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 14, Chuman discloses the following:

a) an anode (2) structure capable of receiving the emitted energy and generating at least a first effect in response to receiving the emitted energy and a second effect in response to not receiving the emitted energy (For Example: See Figure 1).

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4. Claims 13, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chuman et al. (U.S. Patent No. 6,023,124) in view of Hu (U.S. Patent No. 6,328,620) and Xia (U.S. Patent No. 6,034,479).

In regards to claim 13, Chuman discloses the following:

a) a substrate (For Example: See Figure 1).

In regards to claim 13, Chuman fails to disclose the following:

a) circuitry for operating the emitter.

However, Xia discloses a control device (For Example: See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include a control device as disclosed in Xia because it aids in establishing a voltage differential (For Example: See Column 1 Lines 62-65).

Additionally, since Chuman and Xia are both from the same field of endeavor, the purpose disclosed by Xia would have been recognized in the pertinent art of Chuman.

In regards to claim 16, Chuman discloses the following:

a) electronic device is a display device (For Example: See Column 1 Lines 61-65).

In regards to claim 16, Chuman fails to disclose the following:

a) the anode structure is a display screen that creates a visible effect in response to receiving the emitted energy.

However, Xia discloses an anode that is a display screen (For Example: See Column 1 Lines 29-32). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include an anode that is a

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display screen as disclosed in Xia because it aids in providing good display characteristics (For Example: See Column 1 Lines 29-32).

Additionally, since Chuman and Xia are both from the same field of endeavor, the purpose disclosed by Xia would have been recognized in the pertinent art of Chuman.

In regards to claim 17, Chuman fails to disclose the following:

a) display screen includes one or more phosphors operable for emitting photons in response to receiving the emitted energy.

However, Xia discloses a display screen that has phosphors (For Example: See Column 1 Lines 37-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a display screen that has phosphors as disclosed in Xia because it aids in providing the luminescent display (For Example: See Column 1 Lines 29-43).

Additionally, since Chuman and Xia are both from the same field of endeavor, the purpose disclosed by Xia would have been recognized in the pertinent art of Chuman.

5. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chuman et al. (U.S. Patent No. 6,023,124) in view of Hu (U.S. Patent No. 6,328,620), Xia (U.S. Patent No. 6,034,479) and Gibson et al. (U.S. Patent No. 5,557,596).

In regards to claim 15, Chuman fails to disclose the following:

a) reading circuit.

However, Xia discloses a reading circuit (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include a reading circuit as disclosed in Xia because it aids in measuring the current of the pixel (For Example: See Column 5 Lines 6-30).

Additionally, since Chuman and Xia are both from the same field of endeavor, the purpose disclosed by Xia would have been recognized in the pertinent art of Chuman.

b) electronic device is a mass storage device and the anode structure is a recording medium.

However, Gibson et al. ("Gibson") discloses a memory device that has an anode storage area (For Example: See Column 2 Lines 1-9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include a storage medium as disclosed in Gibson because it provides a medium to store data (For Example: See Column 2 Lines 1-9).

Additionally, since Chuman and Gibson are both from the same field of endeavor, the purpose disclosed by Gibson would have been recognized in the pertinent art of Chuman.

6. Claims 21-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chuman et al. (U.S. Patent No. 6,023,124) in view of Moyer (U.S. Patent No. 5,473,218) and Hu (U.S. Patent No. 6,328,620).

In regards to claim 21, Chuman discloses the following:

- a) an electron supply layer (For Example: See Figure 1);
- b) a tunneling layer formed on the electron supply layer (For Example: See Figure 1);
- c) a cathode layer (For Example: See Figure 1).

In regards to claim 21, Chuman fails to disclose the following:

- a) an insulator layer having an opening.

However, Moyer discloses an insulator layer having an opening (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the

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invention was made to modify the semiconductor device of Chuman to include an insulator layer having an opening as disclosed in Moyer because it aids in permitting emission to occur in the opening (For Example: See Column 1 Lines 51-67 and Column 2 Lines 1-17).

Additionally, since Chuman and Moyer are both from the same field of endeavor, the purpose disclosed by Moyer would have been recognized in the pertinent art of Chuman.

b) an annealing process.

However, Hu discloses an annealing process (For Example: See Column 3 Lines 45-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include an annealing process as disclosed in Hu because it aids in improving the contact among components (For Example: See Column 3 Lines 46-64).

Additionally, since Chuman and Hu are both from the same field of endeavor, the purpose disclosed by Hu would have been recognized in the pertinent art of Chuman.

In regards to claim 22, Chuman fails to disclose the following:

a) emitting photons in addition to the electron emission.

However, Moyer discloses the emission of photons (For Example: See Column 3 Lines 1-3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include the emission of photons as disclosed in Moyer because it aids in emitting light (For Example: See Column 3 Lines 1-3).

Additionally, since Chuman and Moyer are both from the same field of endeavor, the purpose disclosed by Moyer would have been recognized in the pertinent art of Chuman.

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In regards to claim 23, Chuman discloses the following:

a) tunneling layer is a metal cluster dielectric (For Example: See Column 4 Lines 20-62).

In regards to claim 24, Chuman discloses the following:

a) emission rate greater than about 0.01 Amps per square centimeter (For Example: See Column 2 Lines 17-28).

Additionally, the applicant has not established the critical nature of the emission rate greater than .01 Amps. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 25, Chuman discloses the following:

a) tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , $WSiN$, $TaAlO_xN_y$, $TaAlO_x$, and AlO_xN_y (For Example: See Column 4 Lines 20-62).

In regards to claim 26, Chuman discloses the following:

a) tunneling layer has a thickness less than about 500 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 500 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 27, Chuman discloses the following:

a) tunneling layer has a thickness within the range of 50 to about 250 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 50 to about 250 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

7. Claims 28, 31 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chuman et al. (U.S. Patent No. 6,023,124) in view of Moyer (U.S. Patent No. 5,473,218), Hu (U.S. Patent No. 6,328,620) and Xia (U.S. Patent No. 6,034,479).

In regards to claim 28, Chuman discloses the following:

a) the emitter emits a visible light source (For Example: See Figure 1).

In regards to claim 28, Chuman fails to disclose the following:

a) a lens for focusing the visible light source, wherein the lens is coated with a transparent conducting surface to capture electrons emitted from the emitter.

However, Xia discloses a screen (16) (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include a screen as disclosed in Xia because it aids in providing the luminescent display (For Example: See Column 1 Lines 29-32).

Additionally, since Chuman and Xia are both from the same field of endeavor, the purpose disclosed by Xia would have been recognized in the pertinent art of Chuman.

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In regards to claim 31, Moyer fails to disclose the following:

a) a microprocessor; the electronic device coupled to the microprocessor; and memory coupled to the microprocessor, the microprocessor operable of executing instructions from the memory to transfer data between the memory and the electronic device.

However, Xia discloses a microprocessor (33) (For Example: See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a microprocessor as disclosed in Xia because it aids in controlling the circuit (For Example: See Column 4 Line 12).

Additionally, since Chuman and Xia are both from the same field of endeavor, the purpose disclosed by Xia would have been recognized in the pertinent art of Chuman.

In regards to claim 33, Moyer fails to disclose the following:

a) electronic device is a display device.

However, Xia discloses a field emission display device (For Example: See Column 1 Lines 29-32). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a display device as disclosed in Xia because field emission is important in providing good portable screens with good display characteristics.

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8. Claims 29 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chuman et al. (U.S. Patent No. 6,023,124) in view of Moyer (U.S. Patent No. 5,473,218), Hu (U.S. Patent No. 6,328,620) and Gibson et al. (U.S. Patent No. 5,557,596).

In regards to claim 29, Chuman fails to disclose the following:

a) a storage medium in close proximity to the emitter, the storage medium having a storage area being in one of a plurality of states to represent the information stored in that storage area; such that an effect is generated when the electron beam current bombards the storage area; the magnitude of the effect depends on the state of the storage area; and the information stored in the storage area is read by measuring the magnitude of the effect.

However, Gibson discloses a storage device (For Example: See Figure 1 and Column 2 Lines 10-20). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include a storage device as disclosed in Gibson because it provides a medium to store data (For Example: See Column 2 Lines 1-9).

Additionally, since Chuman and Gibson are both from the same field of endeavor, the purpose disclosed by Gibson would have been recognized in the pertinent art of Chuman.

In regards to claim 32, Moyer fails to disclose the following:

a) electronic device is a storage device.

However, Gibson et al. ("Gibson") discloses a memory device that has an anode storage area (For Example: See Column 2 Lines 1-9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include a storage medium as disclosed in Gibson because it provides a medium to store data (For Example: See Column 2 Lines 1-9).

Additionally, since Chuman and Gibson are both from the same field of endeavor, the purpose disclosed by Gibson would have been recognized in the pertinent art of Chuman.

9. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chuman et al. (U.S. Patent No. 6,023,124) in view of Moyer (U.S. Patent No. 5,473,218), Hu (U.S. Patent No. 6,328,620) and Suehiro et al. (U.S. Publication No. 2002/0024808).

In regards to claim 30, Chuman fails to disclose the following:

a) a focusing device for converging the emissions from the emitter.

However, Suehiro et al. ("Suehiro") discloses converging emissions (For Example: See Figure 40). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include converging emissions as disclosed in Suehiro because it aids in the radiation of light (For Example: See Paragraphs 143 and 144).

Additionally, since Chuman and Suehiro are both from the same field of endeavor, the purpose disclosed by Suehiro would have been recognized in the pertinent art of Chuman.

10. Claims 34-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chuman et al. (U.S. Patent No. 6,023,124) in view of Moyer (U.S. Patent No. 5,473,218), Hu (U.S. Patent No. 6,328,620) and Huang et al. (U.S. Patent No. 5,702,281).

In regards to claim 34, Chuman discloses the following:

a) an electron supply surface (For Example: See Figure 1);

b) a tunneling layer formed on the electron supply (For Example: See Figure 1);

and

c) a cathode layer (For Example: See Figure 1).

In regards to claim 34, Chuman fails to disclose the following:

- a) an insulator layer having a first opening.

However, Moyer discloses an insulator layer having an opening (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include an insulator layer having an opening as disclosed in Moyer because it aids in permitting emission to occur in the opening (For Example: See Column 1 Lines 51-67 and Column 2 Lines 1-17).

Additionally, since Chuman and Moyer are both from the same field of endeavor, the purpose disclosed by Moyer would have been recognized in the pertinent art of Chuman.

- b) an adhesion layer.

However, Huang et al. ("Huang") discloses an adhesion layer (For Example: See Column 3 Lines 60-67). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include an adhesion layer as disclosed in Huang because it aids in providing improved adhesion among the layers (For Example: See Column 3 Lines 60-67).

Additionally, since Chuman and Huang are both from the same field of endeavor, the purpose disclosed by Huang would have been recognized in the pertinent art of Chuman.

- c) a conductive layer.

However, Moyer discloses a conductive layer (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a conductive layer as disclosed in Moyer because it aids in controlling the emission of electrons.

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Additionally, since Chuman and Moyer are both from the same field of endeavor, the purpose disclosed by Moyer would have been recognized in the pertinent art of Chuman.

d) an emitter subjected to an annealing process.

However, Hu discloses an annealing process (For Example: See Column 3 Lines 45-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include an annealing process as disclosed in Hu because it aids in improving the contact among components (For Example: See Column 3 Lines 46-64).

Additionally, since Chuman and Hu are both from the same field of endeavor, the purpose disclosed by Hu would have been recognized in the pertinent art of Chuman.

In regards to claim 35, Chuman discloses the following:

a) emission rate of about .1 to about 1.0 (For Example: See Column 2 Lines 17-28).

Additionally, the applicant has not established the critical nature of the emission rate of about .1 to about 1.0. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 36, Chuman discloses the following:

a) tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , WSiN , TaAlO_xN_y , TaAlO_x , and AlO_xN_y (For Example: See Column 4 Lines 20-62).

In regards to claim 37, Chuman discloses the following:

a) tunneling layer has a thickness within the range of 50 to about 250 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 50 to about 250 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 38, Chuman discloses the following:

a) tunneling layer has a thickness less than about 100 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 100 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 39, Chuman discloses the following:

a) tunneling layer has a thickness less than about 500 Angstroms (For Example: See Column 5 Lines 30-33).

Additionally, the applicant has not established the critical nature of the dimension of 500 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a

situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 40, Chuman fails to disclose the following:

a) electron emitting surface also emits photon energy.

However, Moyer discloses the emission of photons (For Example: See Column 3 Lines 1-3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chuman to include the emission of photons as disclosed in Moyer because it aids in emitting light (For Example: See Column 3 Lines 1-3).

Additionally, since Chuman and Moyer are both from the same field of endeavor, the purpose disclosed by Moyer would have been recognized in the pertinent art of Chuman.

Response to Arguments

11. Applicant's arguments filed August 4, 2003 have been fully considered but they are not persuasive. Applicant argues that “Hu teaches using his annealing process to “maintain a sharp profile”...Applicant’s are using their annealing process not to improve mechanical contact (to increase hardness) but to reduce the electrical resistance and to increase electron emissions.” Additionally, Applicant argues that the “annealing process produces unexpected results which as shown provide emission current density at least one order of magnitude larger than that disclosed by previous art made of record.” However, Applicant has not disclosed in the claims any of the limitations disclosed above. Therefore, Applicant’s arguments are not deemed persuasive.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian, can be reached on 703-308-4905. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

ML
November 1, 2003